

IN THE CLAIMS

Please cancel Claims 1, 17, 25, 49, and 50 without prejudice or disclaimer.

Claim 1 (cancelled).

Claim 2 (currently amended): A retract circuit for retracting a data transducer carriage assembly of a mass data storage device to a retracted position, comprising:

a digital state machine;

said digital state machine being user programmable to operate in a selected retract mode;

an analog control circuit for receiving control signals from said digital state machine for providing analog retract signals to move said data transducer carriage assembly; and

~~The retract circuit of claim 1 further comprising an analog driver to receive control signals from said digital state machine, said analog driver having a programmable gain.~~

Claim 3 (currently amended): A retract circuit for retracting a data transducer carriage assembly of a mass data storage device to a retracted position, comprising:

a digital state machine;

said digital state machine being user programmable to operate in a selected retract mode;

and an analog control circuit for receiving control signals from said digital state machine for providing analog retract signals to move said data transducer carriage assembly.

~~The retract circuit of claim 1 wherein said digital state machine is user programmable to operate in constant voltage, velocity detect, float and pulse, and crash stop detect modes.~~

Claim 4 (currently amended): A retract circuit for retracting a data transducer carriage assembly of a mass data storage device to a retracted position, comprising:

a digital state machine;

said digital state machine being user programmable to operate in a selected retract mode;

and an analog control circuit for receiving control signals from said digital state machine for providing analog retract signals to move said data transducer carriage assembly.

~~The retract circuit of claim 1 wherein said digital state machine is programmed to detect a velocity of said data transducer carriage assembly.~~

Claim 5 (original): The retract circuit of claim 4 wherein said digital state machine is programmed to detect an error velocity of said data transducer carriage assembly from a difference of a measured voltage across said data transducer driver from a predetermined voltage.

Claim 6 (original): The retract circuit of claim 5 wherein said predetermined voltage is user programmable.

Claim 7 (original): The retract circuit of claim 5 wherein said predetermined voltage is user programmable to a resolution of two bits.

Claim 8 (original): The retract circuit of claim 5 wherein said predetermined voltage is user programmable to a resolution of more than two bits.

Claim 9 (original): A retract circuit for retracting a data transducer carriage assembly of a mass data storage device to a retracted position, comprising:

means for establishing a digital state machine;

said means for establishing a digital state machine being user programmable to operate in a selected retract mode;

and means for establishing an analog control circuit for receiving control signals from said means for establishing a digital state machine for providing analog retract signals to move said data transducer carriage assembly.

Claim 10 (original): The retract circuit of claim 9 further comprising means for establishing an analog driver to receive control signals from said means for establishing digital state machine, said means for establishing analog driver having a programmable gain.

Claim 11 (original): The retract circuit of claim 9 wherein said means for establishing digital state machine is user programmable to operate in constant voltage, velocity detect, float and pulse, and crash stop detect modes.

Claim 12 (original): The retract circuit of claim 9 wherein said means for establishing digital state machine is programmed to detect a velocity of said data transducer carriage assembly.

Claim 13 (original): The retract circuit of claim 12 wherein said means for establishing digital state machine is programmed to detect an error velocity of said data transducer carriage assembly from a difference of a measured voltage across said data transducer driver from a predetermined voltage.

Claim 14 (original): The retract circuit of claim 13 wherein said predetermined voltage is user programmable.

Claim 15 (original): The retract circuit of claim 13 wherein said predetermined voltage is user programmable to a resolution of two bits.

Claim 16 (original): The retract circuit of claim 13 wherein said predetermined voltage is user programmable to a resolution of more than two bits.

Claim 17 (cancelled).

Claim 18 (currently amended): A mass data storage device, comprising:
a retract circuit for retracting a data transducer carriage assembly of a mass data storage device to a retracted position, including
a digital state machine;

said digital state machine being user programmable to operate in a selected retract mode;

an analog control circuit for receiving control signals from said digital state machine for providing analog retract signals to move said data transducer carriage assembly; and

~~The mass data storage device of claim 17 further comprising an analog driver to receive control signals from said digital state machine, said analog driver having a programmable gain.~~

Claim 19 (currently amended): A mass data storage device, comprising:

a retract circuit for retracting a data transducer carriage assembly of a mass data storage device to a retracted position, including

a digital state machine;

said digital state machine being user programmable to operate in a selected retract mode;

and an analog control circuit for receiving control signals from said digital state machine for providing analog retract signals to move said data transducer carriage assembly.

~~The mass data storage device of claim 17 wherein said digital state machine is user programmable to operate in constant voltage, velocity detect, float and pulse, and crash stop detect modes.~~

Claim 20 (currently amended): A mass data storage device, comprising:

a retract circuit for retracting a data transducer carriage assembly of a mass data storage device to a retracted position, including

a digital state machine;

said digital state machine being user programmable to operate in a selected retract mode;

and an analog control circuit for receiving control signals from said digital state machine for providing analog retract signals to move said data transducer carriage assembly,

~~The mass data storage device of claim 17 wherein~~ said digital state machine is programmed to detect a velocity of said data transducer carriage assembly.

Claim 21 (original): The mass data storage device of claim 20 wherein said digital state machine is programmed to detect an error velocity of said data transducer carriage assembly from a difference of a measured voltage across said data transducer driver from a predetermined voltage.

Claim 22 (original): The mass data storage device of claim 21 wherein said predetermined voltage is user programmable.

Claim 23 (original): The mass data storage device of claim 21 wherein said predetermined voltage is user programmable to a resolution of two bits.

Claim 24 (original): The mass data storage device of claim 21 wherein said predetermined voltage is user programmable to a resolution of more than two bits.

Claim 25 (cancelled).

Claim 26 (currently amended): A method for retracting a data transducer carriage assembly of a mass data storage device to a retracted position, comprising:

providing a user programmable digital state machine to operate in a selected retract mode;

providing analog control circuit in response to signals provided by said digital state machine for providing analog retract signals to said data transducer carriage assembly; and

~~The method of claim 25 further comprising~~ providing an analog driver having a programmable gain to receive control signals from said digital state machine.

Claim 27 (currently amended): A method for retracting a data transducer carriage assembly of a mass data storage device to a retracted position, comprising:

providing a user programmable digital state machine to operate in a selected retract mode;

and providing analog control circuit in response to signals provided by said digital state machine for providing analog retract signals to said data transducer carriage assembly,

~~The method of claim 25 wherein~~ said providing a digital state machine comprises providing a digital state machine that is user programmable to operate in constant voltage, velocity detect, float and pulse, and crash stop detect modes.

Claim 28 (currently amended): A method for retracting a data transducer carriage assembly of a mass data storage device to a retracted position, comprising:

providing a user programmable digital state machine to operate in a selected retract mode;

and providing analog control circuit in response to signals provided by said digital state machine for providing analog retract signals to said data transducer carriage assembly.

The method of claim 25 wherein said providing a digital state machine comprises providing a digital state machine that is programmed to detect a velocity of said data transducer carriage assembly.

Claim 29 (currently amended): A method for retracting a data transducer carriage assembly of a mass data storage device to a retracted position, comprising:

providing a user programmable digital state machine to operate in a selected retract mode;

and providing analog control circuit in response to signals provided by said digital state machine for providing analog retract signals to said data transducer carriage assembly.

The method of claim 25 wherein said providing a digital state machine comprises providing a digital state machine that is programmed to detect an error velocity of said data transducer carriage assembly from a difference of a measured voltage across said data transducer driver from a predetermined voltage.

Claim 30 (original): The method of claim 29 wherein said predetermined voltage is user programmable.

Claim 31 (original): The method of claim 29 wherein said predetermined voltage is user programmable to a resolution of two bits.

Claim 32 (original): The method of claim 29 wherein said predetermined voltage is user programmable to a resolution of more than two bits.

Claim 33 (original): A retract system for retracting a head assembly in a hard disk drive, comprising:

means for measuring a velocity of a voice coil motor (VCM),

means responsive to a velocity measurement for establishing a retract voltage;

and means for applying said retract voltage to said VCM.

Claim 34 (original): The retract system of claim 33 further comprising:

a digital processor for configuring said means for measuring, means for establishing a retract voltage, and means for applying said retract voltage to operate in a plurality of operating modes.

Claim 35 (original): The retract system of claim 33 further comprising means for operating said hard disk drive in one of a plurality of selectable operating modes.

Claim 36 (original): The retract system of claim 35 wherein said means for operating said hard disk drive in one of a plurality of selectable operating modes comprises means for operating said hard disk drive in a constant voltage mode in which a constant retract voltage is applied to said voice coil motor when a retract signal is enabled.

Claim 37 (original): The retract system of claim 35 wherein said means for operating said hard disk drive in one of a plurality of selectable operating modes comprises means for operating said hard disk drive in a velocity detect mode in which drive signals are removed from said voice coil motor, a velocity of said head assembly is determined, and an appropriate constant retract voltage is applied to said voice coil motor.

Claim 38 (original): The retract system of claim 35 wherein said means for operating said hard disk drive in one of a plurality of selectable operating modes comprises means for operating said hard disk drive in a a float and pulse mode in which drive signals are removed from said voice coil motor, and a repeating pulse is applied a predetermined number of times.

Claim 39 (original): The retract system of claim 38 in which the repeating pulse is applied 32 times.

Claim 40 (original): The retract system of claim 35 wherein said means for operating said hard disk drive in one of a plurality of selectable operating modes comprises means for operating said hard disk drive in a crash-stop-detect mode in which a condition in which said head assembly is against crash the stop is detected, and a constant voltage is applied to hold said head assembly thereagainst.

Claim 41 (original): In a hard disk drive, a system for moving a head assembly to a retract position, a position of said head assembly being controlled by a voice coil motor, comprising:

an analog section connected to said voice coil motor to apply controllable drive voltages thereto to selectively position said head assembly;

and a digital section connected to receive signals from said analog section and said hard disk drive that reflect operating conditions of said hard disk drive, said digital section including:

a digital state machine defining a number of operating states, said digital state machine moving from state to state in response to conditions in said hard disk drive, and operating to produce digital command signals including a retract command to control said analog section to move said head assembly to said retract position,

and a decoder and digital to analog converter to decode said digital command signals and convert said digital command signals to analog signals for controlling said analog section.

Claim 42 (original): The retract system of claim 41 wherein said digital state machine includes states to determine a current velocity of said head assembly and to produce command signals to said analog section to command said analog section to apply a retract voltage related to said current velocity to said voice coil motor.

Claim 43 (original): The retract system of claim 41 wherein said digital section contains a digital processor connected to configure said state machine to operate in one of a number of operating modes.

Claim 44 (original): The retract system of claim 43 wherein said operating modes includes a constant voltage mode in which a constant retract voltage is applied to said voice coil motor when a retract signal is enabled.

Claim 45 (original): The retract system of claim 43 wherein said operating modes includes a velocity detect mode in which drive signals are removed from said voice coil

motor, a velocity of said head assembly is determined, and an appropriate constant retract voltage is applied to said voice coil motor.

Claim 46 (original): The retract system of claim 43 wherein said operating modes includes a float and pulse mode in which drive signals are removed from said voice coil motor, and a repeating pulse is applied a predetermined number of times.

Claim 47 (original): This retract system of claim 46 in which the repeating pulse is applied 32 times.

Claim 48 (original): The retract system of claim 43 wherein said operating modes includes a crash-stop-detect mode in which a condition in which said head assembly is against crash the stop is detected, and a constant voltage is applied to hold said head assembly thereagainst.

Claims 49 and 50 (cancelled).

Claim 51 (currently amended): A method for retracting a head assembly in a hard disk drive, comprising the steps for:

measuring a velocity of a voice coil motor (VCM) to determine a measured velocity,

establishing a retract voltage responsive to said measured velocity;

applying said retract voltage to said VCM; and

operating said hard disk drive in one of a plurality of selectable operating modes,

~~The method of claim 50 wherein said operating said hard disk drive in one of a plurality of selectable operating modes comprises operating said hard disk drive in a float and pulse mode in which drive signals are removed from said voice coil motor, and a repeating pulse is applied a predetermined number of times.~~

Claim 54 (original): The method of claim 53 in which the repeating pulse is applied 32 times.

Claim 55 (currently amended): A method for retracting a head assembly in a hard disk drive, comprising the steps for:

measuring a velocity of a voice coil motor (VCM) to determine a measured velocity,

establishing a retract voltage responsive to said measured velocity;

applying said retract voltage to said VCM; and

operating said hard disk drive in one of a plurality of selectable operating modes,

~~The method of claim 50 wherein said operating said hard disk drive in one of a plurality of selectable operating modes comprises operating said hard disk drive in a crash-stop-detect mode in which a condition in which said head assembly is against crash the stop is detected, and a constant voltage is applied to hold said head assembly thereagainst.~~

~~The method of claim 50 wherein said operating said hard disk drive in one of a plurality of selectable operating modes comprises operating said hard disk drive in a constant voltage mode in which a constant retract voltage is applied to said voice coil motor when a retract signal is enabled.~~

Claim 52 (currently amended): A method for retracting a head assembly in a hard disk drive, comprising the steps for:

measuring a velocity of a voice coil motor (VCM) to determine a measured velocity,

establishing a retract voltage responsive to said measured velocity;

applying said retract voltage to said VCM; and

operating said hard disk drive in one of a plurality of selectable operating modes,

~~The method of claim 50 wherein said operating said hard disk drive in one of a plurality of selectable operating modes comprises operating said hard disk drive in a velocity detect mode in which drive signals are removed from said voice coil motor, a velocity of said head assembly is determined, and an appropriate constant retract voltage is applied to said voice coil motor.~~

Claim 53 (currently amended): A method for retracting a head assembly in a hard disk drive, comprising the steps for:

measuring a velocity of a voice coil motor (VCM) to determine a measured velocity,

establishing a retract voltage responsive to said measured velocity;

applying said retract voltage to said VCM; and

operating said hard disk drive in one of a plurality of selectable operating modes,